

SN54ABT5402, SN74ABT5402 12-BIT LINE/MEMORY DRIVERS WITH 3-STATE OUTPUTS

SCBS100B – JANUARY 1992 – REVISED JULY 1994

- Output Ports Have 25-Ω Series Resistors, So No External Resistors Are Required
- State-of-the-Art *EPIC-II B*™ BiCMOS Design Significantly Reduces Power Dissipation
- Latch-Up Performance Exceeds 500 mA Per JEDEC Standard JESD-17
- Typical V_{OLP} (Output Ground Bounce) < 1 V at $V_{CC} = 5$ V, $T_A = 25^\circ\text{C}$
- Typical V_{OLV} (Output Undershoot) < 0.5 V at $V_{CC} = 5$ V, $T_A = 25^\circ\text{C}$
- Package Options Include Plastic Small-Outline (DW) Packages, Ceramic Chip Carriers (FK) and DIPs (JT)

description

These 12-bit buffers and line drivers are designed specifically to improve both the performance and density of 3-state memory address drivers, clock drivers, and bus-oriented receivers and transmitters.

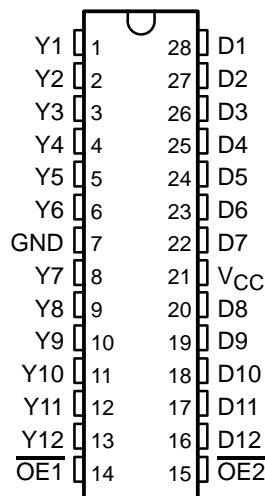
The 3-state control gate is a 2-input AND gate with active-low inputs so that if either output-enable ($\overline{OE1}$ or $\overline{OE2}$) input is high, all 12 outputs are in the high-impedance state.

The outputs, which are designed to source or sink up to 12 mA, include 25-Ω series resistors to reduce overshoot and undershoot.

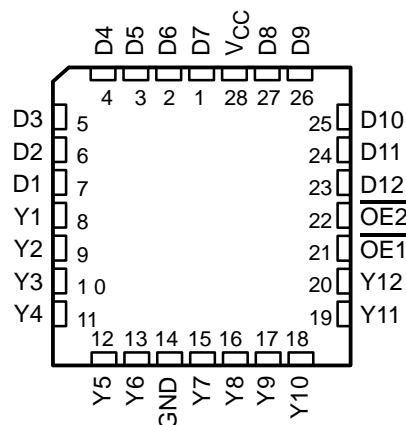
To ensure the high-impedance state during power up or power down, \overline{OE} should be tied to V_{CC} through a pullup resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

The SN54ABT5402 is characterized for operation over the full military temperature range of -55°C to 125°C . The SN74ABT5402 is characterized for operation from -40°C to 85°C .

SN54ABT5402 . . . JT PACKAGE
SN74ABT5402 . . . DW PACKAGE
(TOP VIEW)



SN54ABT5402 . . . FK PACKAGE
(TOP VIEW)



FUNCTION TABLE

INPUTS			OUTPUT Y
$\overline{OE1}$	$\overline{OE2}$	D	
L	L	L	L
L	L	H	H
H	X	X	Z
X	H	X	Z

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**TEXAS
INSTRUMENTS**

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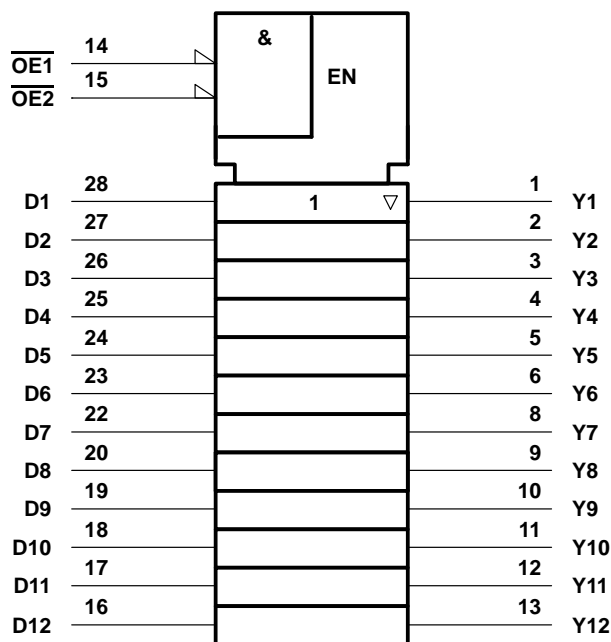
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12-BIT LINE/MEMORY DRIVERS

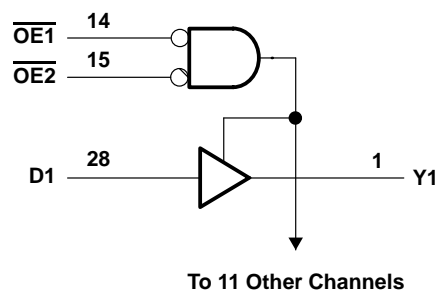
WITH 3-STATE OUTPUTS

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logic symbol†



logic diagram (positive logic)



† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

Pin numbers shown are for the DW and JT packages.

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)‡

Supply voltage range, V_{CC}	–0.5 V to 7 V
Input voltage range, V_I (see Note 1)	–0.5 V to 7 V
Voltage range applied to any output in the high state or power-off state, V_O	–0.5 V to 5.5 V
Current into any output in the low state, I_O	30 mA
Input clamp current, I_{IK} ($V_I < 0$)	–18 mA
Output clamp current, I_{OK} ($V_O < 0$)	–50 mA
Maximum power dissipation at $T_A = 55^\circ\text{C}$ (in still air) (see Note 2): DW package	1.2 W
Storage temperature range	–65°C to 150°C

‡ Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

- NOTES:
1. The input and output negative-voltage ratings may be exceeded if the input and output clamp-current ratings are observed.
 2. The maximum package power dissipation is calculated using a junction temperature of 150°C and a board trace length of 750 mils. For more information, refer to the *Package Thermal Considerations* application note in the 1994 *ABT Advanced BiCMOS Technology Data Book*, literature number SCBD002B.

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recommended operating conditions (see Note 3)

		SN54ABT5402		SN74ABT5402		UNIT
		MIN	MAX	MIN	MAX	
V_{CC}	Supply voltage	4.5	5.5	4.5	5.5	V
V_{IH}	High-level input voltage	2		2		V
V_{IL}	Low-level input voltage		0.8		0.8	V
V_I	Input voltage	0	V_{CC}	0	V_{CC}	V
I_{OH}	High-level output current		–12		–12	mA
I_{OL}	Low-level output current		12		12	mA
$\Delta t/\Delta v$	Input transition rise or fall rate	Outputs enabled		10	10	ns/V
T_A	Operating free-air temperature	–55	125	–40	85	°C

NOTE 3: Unused or floating inputs must be held high or low.

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS		$T_A = 25^\circ\text{C}$			SN54ABT5402		SN74ABT5402		UNIT
			MIN	TYP†	MAX	MIN	MAX	MIN	MAX	
V_{IK}	$V_{CC} = 4.5\text{ V}$, $I_I = -18\text{ mA}$				–1.2		–1.2		–1.2	V
V_{OH}	$V_{CC} = 4.5\text{ V}$, $I_{OH} = -1\text{ mA}$		3.35	3.7		3.3		3.35		V
	$V_{CC} = 5\text{ V}$, $I_{OH} = -1\text{ mA}$		3.85	4.2		3.8		3.85		
	$V_{CC} = 4.5\text{ V}$	$I_{OH} = -3\text{ mA}$				3		3.1		
		$I_{OH} = -12\text{ mA}$	2.6					2.6		
V_{OL}	$V_{CC} = 4.5\text{ V}$	$I_{OL} = 8\text{ mA}$				0.8		0.65		V
		$I_{OL} = 12\text{ mA}$						0.8		
I_I	$V_{CC} = 5.5\text{ V}$, $V_I = V_{CC}$ or GND				± 1		± 1		± 1	μA
I_{OZH}	$V_{CC} = 5.5\text{ V}$, $V_O = 2.7\text{ V}$				50		50		50	μA
I_{OZL}	$V_{CC} = 5.5\text{ V}$, $V_O = 0.5\text{ V}$				–50		–50		–50	μA
I_{off}	$V_{CC} = 0$, V_I or $V_O \leq 4.5\text{ V}$				± 100				± 100	μA
I_{CEX}	$V_{CC} = 5.5\text{ V}$, $V_O = 5.5\text{ V}$	Outputs high			50		50		50	μA
I_O	$V_{CC} = 5.5\text{ V}$, $V_O = 2.5\text{ V}$		–25	–45	–100	–25	–100	–25	–100	mA
I_{OS}^\ddagger	$V_{CC} = 5.5\text{ V}$, $V_O = 0$		–50		–200	–50	–200	–50	–200	mA
I_{CC}	$V_{CC} = 5.5\text{ V}$, $I_O = 0$, $V_I = V_{CC}$ or GND	Outputs high		5	50		50		50	μA
		Outputs low		36	45		45		45	mA
		Outputs disabled		1	50		50		50	μA
ΔI_{CC}^\S	$V_{CC} = 5.5\text{ V}$, One input at 3.4 V, Other inputs at V_{CC} or GND	Data inputs								mA
		Outputs enabled			1.5		1.5		1.5	
		Outputs disabled			0.05		0.05		0.05	
		Control inputs			1.5		1.5		1.5	
C_i	$V_I = 2.5\text{ V}$ or 0.5 V			3						pF
C_o	$V_O = 2.5\text{ V}$ or 0.5 V			8						pF

† All typical values are at $V_{CC} = 5\text{ V}$.

‡ Not more than one output should be tested at a time, and the duration of the test should not exceed one second.

§ This is the increase in supply current for each input that is at the specified TTL voltage level rather than V_{CC} or GND.

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switching characteristics over recommended ranges of supply voltage and operating free-air temperature, $C_L = 50$ pF (unless otherwise noted) (see Figure 1)

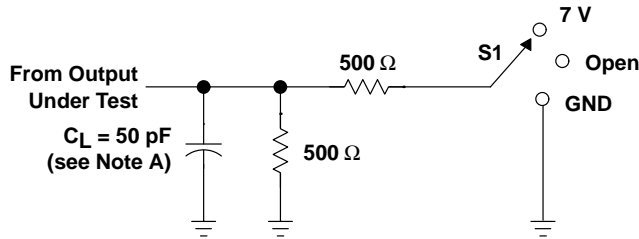
PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 5$ V, $T_A = 25^\circ\text{C}$			SN54ABT5402		SN74ABT5402		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{PLH}	D	Y	2	4.5	5.7	2	6.7	2	6.5	ns
t_{PHL}			1.5	3.7	4.5	1.5	5.5	1.5	5.2	
t_{PZH}	\overline{OE}	Y	2.5	5.7	6.6	2.5	8.6	2.5	8.5	ns
t_{PZL}			2	4.4	5.5	2	6.9	2	6.8	
t_{PHZ}	\overline{OE}	Y	1.5	3.6	4.4	1.5	5.5	1.5	5.2	ns
t_{PLZ}			1.5	4.2	5.4	1.5	7.4	1.5	6.9	

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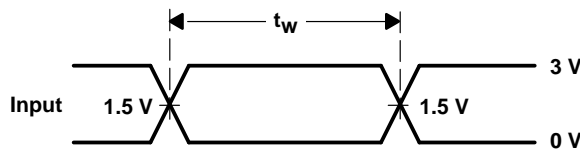
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PARAMETER MEASUREMENT INFORMATION

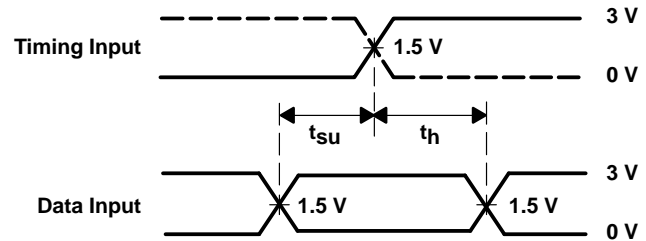


LOAD CIRCUIT FOR OUTPUTS

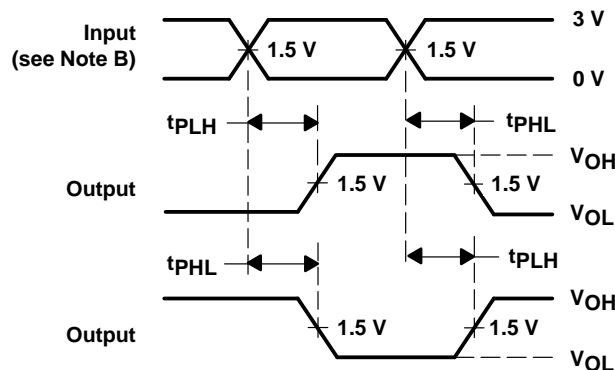
TEST	S1
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	7 V
t_{PHZ}/t_{PZH}	Open



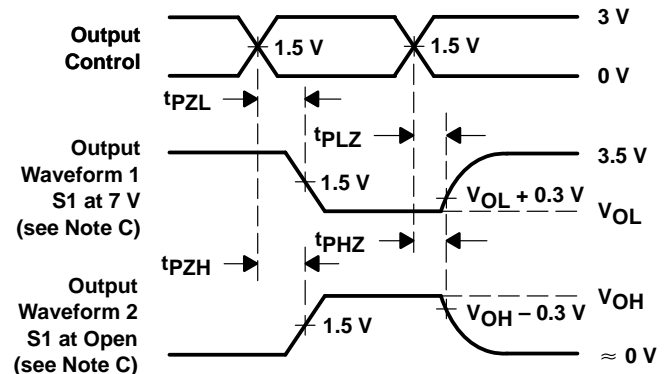
VOLTAGE WAVEFORMS
PULSE DURATION



VOLTAGE WAVEFORMS
SETUP AND HOLD TIMES



VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES
INVERTING AND NONINVERTING OUTPUTS



VOLTAGE WAVEFORMS
ENABLE AND DISABLE TIMES
LOW- AND HIGH-LEVEL ENABLING

- NOTES:
- C_L includes probe and jig capacitance.
 - All input pulses are supplied by generators having the following characteristics: $PRR \leq 10 \text{ MHz}$, $Z_O = 50 \Omega$, $t_r \leq 2.5 \text{ ns}$, $t_f \leq 2.5 \text{ ns}$.
 - Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
 - The outputs are measured one at a time with one transition per measurement.

Figure 1. Load Circuit and Voltage Waveforms

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